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Do School Subsidies Promote Human Capital Investment among the Poor?

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Abstract

We investigate the hypothesis that conditioning transfers to poor families on school attendance leads to a reallocation of household resources enhancing the human capital of the next generation, via the effect of the conditionality on the shadow price of human capital and (possibly) via the effect of the transfers on household bargaining. We provide a model to study the effects of conditional transfers on intra-household allocations, and provide suggestive evidence of the importance of price effects using data from a conditional transfer program in Mexico.

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1 Introduction

The design of social policies which encourage human capital accumulation among the poor, thus breaking the transmission of poverty from one generation to the next, is a basic concern for policymakers and economists. Roughly speaking, these policies can be classified as either "supply-side" interventions, attempting to improve the infrastructure or quality of education, or "demand-side" interventions, attempting to provide incentives for poor parents to keep their children longer in school and engage in other activities bolstering human capital accumulation. A large number of developing countries, including Mexico, Brazil, Indonesia, Turkey, Bangladesh, Colombia, Honduras, Jamaica, Bolivia, Nicaragua and Peru, have adopted demand-side interventions, where cash transfers to parents are conditional on the school attendance of their children. In this paper, we provide a model to study the effects of conditional transfers on intra-household allocations, and provide suggestive evidence of the importance of price effects using data from *Progresa*, a conditional transfer program in Mexico.

The model we propose combines elements of the household production approach pioneered by Becker (1965) and Michael and Becker (1973) and the collective household approach developed by Chiappori (1997) and Browning and Chiappori (1998). We treat schooling as one input in the production of children's human capital. Other important inputs are the time devoted by family members to children's human capital and the consumption of children. By subsidizing schooling, conditional transfers reduce the shadow price of human capital acquisition. The substitution effect of transfers, then, involves not only an increase in schooling but also in the time devoted to school homework and in children's consumption. The impact on these other inputs may very well precede the impact on schooling. Suppose, for instance, that conditional transfers induce families which already send their children to primary school to anticipate they will send their children also to secondary school. Then, independently of income effects, parents will devote more resources to children now if these resources are perceived to be complementary with more years of schooling in the production of human capital.

Income and substitution effects are not the only potential effects of conditional transfers on intra-household allocation. Conditional transfers are

typically paid to the mother of the family. A wide empirical literature, pioneered by Thomas (1990) and Schultz (1990), has shown that changes in the household income distribution, and in particular benefits oriented to the mother, may shift household expenditure patterns in directions favorable to children. Thus, we treat the household as a collective entity, and allow schooling subsidies to vary the weight of the mother's preferences in the household utility function. In the description of the model, we provide conditions under which a higher weight of the mother's preferences translates into a shift favorable to children.[1] If parents have CES preferences and the initial bargaining power of the mother is small, these conditions entail that the elasticity of substitution between own consumption and the consumption and human capital of the children cannot be much smaller than one. This implies that substitution effects cannot be small.

Substitution effects capture the mobilization of family resources toward human capital accumulation in response to a lower price for one input, schooling. Note that income and bargaining effects may lead to a reallocation favorable to children even if conditional transfers have little effect on schooling or if schooling is not perceived by families to have a significant impact on human capital acquisition due to, say, low quality of schools available to the poor. Isolating the effects of conditionality on intra-household allocation from income and bargaining effects gives a good indication about the perception by beneficiaries of the impact of increased schooling on human capital acquisition and hence of the impact of a conditional transfer program on breaking the intertemporal poverty linkage.

We use data from the evaluation of Mexico's conditional transfer program, *Progresa*, to examine the substitution effect of the program on intra-household allocation. *Progresa* provides monetary and in-kind transfers to mothers in very poor families in exchange for regular attendance of their children to school and periodic medical check-ups of children and adults. We distinguish the substitution effect from the income and bargaining effects of the program on household expenditure on child goods, which are in the model complementary with human capital accumulation, and on household

[1] As opposed to what seems to be a common implicit assumption in the empirical literature, the assumption that the marginal utility of child goods is larger for the mother than for the father is not sufficient for this result.

expenditure on adult goods, which are substitutes. Our empirical analysis aims at a sample of households for which the income and bargaining effects of the program are similar but which face different schooling subsidies at the margin. We make use of the experimental design of *Progresa* to identify the substitution effect of the program. Our results are supportive of the hypothesis that larger schooling subsidies at the margin lead families to spend a larger share of resources on their children, beyond what is directly required to satisfy conditionality.

Apps and Rees (1997) and Chiappori (1998) have combined before the domestic production and the collective household approaches, but they do not deal with household "public goods" such as children's consumption and human capital. In a recently published paper, Blundell et al. (2005) incorporate household public goods in the collective household approach, and provide marginal conditions under which an increase in the bargaining power of a household member (say, the mother) results in an increase in the household expenditure on public goods. Our CES model illustrates that global monotonicity with respect to the bargaining power of a household member is nongeneric.

In related theoretical work (Martinelli and Parker 2003a), we analyzed the welfare effects for household members of school subsidies under the assumption of Nash bargaining. Our current framework is not restricted to Nash bargaining, allows for changes in the bargaining power of adults as a result of subsidies, and incorporates the household production of human capital.

There are a number of evaluations of the impact of *Progresa* on schooling (for instance, Behrman, Sengupta and Todd 2005, Schultz 2004, Todd and Wolpin 2006, and Behrman, Parker and Todd 2007) and consumption (Hoddinott and Skoufias 2005, Rubalcava, Teruel and Thomas 2005). None of the studies however focuses on isolating the conditionality or price effect from the total program effect although Todd and Wolpin (2007) carry out an exercise comparing the impact of *Progresa* with and without conditionality on schooling attainment. The overall evaluation of *Progresa* is summarized in Behrman and Skoufias (2006), Skoufias (2004), and Parker, Rubalcava and Teruel (2007). Parker, Rubalcava and Teruel (2007) also discuss the evaluation of related programs.

2 The Model

Consider a household consisting of a mother, a father and a child, respectively A, B, and C. The adults' utility functions are separable in four basic commodities, A's consumption (Z_A), B's consumption (Z_B), the child's current consumption (Z_C), and the child's human capital (H). The adults' utility functions are given by

$$U_A = U_A(Z_A, Z_C, H) \text{ and } U_B = U_B(Z_B, Z_C, H).$$

Note that child's consumption and human capital are "public goods" from the point of view of the adults.

There are m market goods. Each household member's consumption is produced domestically using a vector of market goods and a fraction of his or her time:

$$Z_A = Z_A(x_A, t_A),\ Z_B = Z_B(x_B, t_B),\ Z_C = Z_C(x_C, t_C, t_{AC}, t_{BC}),$$

where $x_A \in \Re_+^m$ is the vector of market goods used in the production of Z_A, t_A is the time devoted by A to the production of Z_A, t_{AC} is the time devoted by A to the production of Z_C, and similarly for the other terms.

The child's human capital, in turn, is produced domestically using market goods and the time of each household member:

$$H = H(x_H, h_A, h_B, h_C, e),$$

where x_H is the vector of market goods used in the production of H, h_M is the time devoted by $M = A, B, C$ to the production of human capital, and e is the time spent by the child in formal education.

The endowment of each household member is T units of time, that can be devoted to the activities mentioned before or to earn a wage in the labor market. (This recognizes the existence of child labor.) We normalize to one the prices of market goods and the wages that the members of the household can earn. The household receives an unconditional transfer s_0 and a subsidy rate $0 \leq s < 1$ to formal education. Thus, the household budget constraint is given by

$$1 \cdot (x_A + x_B + x_C + x_H) \leq$$
$$(T - t_A - t_{AC} - h_A) + (T - t_B - t_{BC} - h_B) + (T - t_C - h_C - e) + s_0 + se.$$

As in the collective household approach, we assume that the household decision is the result of maximizing

$$\mu(s_0, s)U_A + (1 - \mu(s_0, s))U_B$$

subject to the household budget constraint. The term μ is the "bargaining power" of A. We write it as a function of s_0 and s to indicate that in principle it may be affected positively by unconditional transfers and by school subsidies, if the family takes advantage of them.[2]

Under the assumption that the production of the basic commodities exhibits constant returns to scale, we can define "commodity prices" π_A, π_B, π_C, and $\pi_H(s)$ to be equal to the unitary cost of production of Z_A, Z_B, Z_C and H, respectively.[3] We write π_H as a function of s because the unitary cost of production of human capital depends on the school subsidy:

$$\begin{aligned} \pi_H(s) &= \min_{x_H, h_A, h_B, h_c, e} x_H + h_A + h_B + h_c + (1 - s)e \\ &\quad \text{s.t. } H(x_H, h_A, h_B, h_c, e) = 1. \end{aligned}$$

Note that commodity prices depend on the household production functions, and thus they may be different across families. The budget constraint of the family can be written as

$$\pi_A Z_A + \pi_B Z_B + \pi_C Z_C + \pi_H(s)H \leq 3T + s_0.$$

Our focus in this paper is on the effect of school subsidies on the household allocation via the change in the shadow price of human capital. Since the subsidy reduces the price of human capital, an increase in the subsidy rate will have a positive price effect on H. It seems likely that the substitution effect will be positive on the consumption of the child and negative on the consumption of the adults. The reason for this conjecture is that child consumption and human capital may very well be complementary from the viewpoint of the preferences of both adults in the household. Parents may

[2] If the mother could divorce then conceivably the existence of the program may affect her bargaining power even if the family does not take advantage of the program.

[3] The unitary costs of production of the basic commodities are given if each member devotes some time to the labor market or if family members are good substitutes in home production. (Otherwise, taking these prices as given is a local approximation.)

grow fond of their children precisely while investing time and other resources in them. Alternatively, parents who expect children to have more human capital and hence a larger income in the future will devote more resources to them at present to foster altruism toward parents in them.

To fix ideas, let the preferences of the parents be given by

$$\begin{aligned} U_A(Z_A, Z_C, H) &= (\text{sign } q)((1-\delta_A)Z_A^q + \delta_A[\min\{Z_C, H\}]^q), \\ U_B(Z_B, Z_C, H) &= (\text{sign } q)((1-\delta_B)Z_B^q + \delta_B[\min\{Z_C, H\}]^q) \end{aligned}$$

for $0 \neq q < 1$, with $0 < \delta_B < \delta_A < 1$. Note that the objective function of the family has a CES form. Let $e_{ch} = (\pi_C Z_C + \pi_H(s)Z_C)/(3T + s_0)$ be the expenditure share of child's consumption and human capital. Using the well-known CES demand function, we get:

$$e_{ch} = (\mu\delta_A + (1-\mu)\delta_B)^{1/(1-q)}(\pi_C + \pi_H(s))^{q/(q-1)}\Gamma^{-1},$$

where

$$\begin{aligned} \Gamma = (\mu(1-\delta_A))^{1/(1-q)}\pi_A^{q/(q-1)} &+ ((1-\mu)(1-\delta_B))^{1/(1-q)}\pi_B^{q/(q-1)} \\ &+ (\mu\delta_A + (1-\mu)\delta_B)^{1/(1-q)}(\pi_C + \pi_H(s))^{q/(q-1)}. \end{aligned}$$

The income effect on expenditure shares is zero by assumption, since CES preferences are homothetic. Thus, the effect of a change in the subsidy rate on the resources destined to the child can be decomposed in a substitution effect, i.e. the change in e_{ch} due to the change in $\pi_H(s)$ holding μ constant at its initial value, and a bargaining effect, i.e. the change in e_{ch} due to the change in μ holding $\pi_H(s)$ constant at its final value.

Interestingly, even if the bargaining power of the mother increases with the school subsidy, the bargaining effect is not necessarily positive. Differentiating e_{ch} with respect to μ, we get that the relationship between the resources destined to the child and the bargaining power of the mother is inverted-U shaped if $q > 0$ and U-shaped if $q < 0$. This means that if the family chooses a Pareto allocation and the initial bargaining power of the mother is small, the bargaining effect is positive if and only if $q > 0$.

Finally, differentiating e_{ch} with respect to s, we get

$$\frac{\partial e_{ch}}{\partial s} = \frac{q}{1-q} e_{ch}(1-e_{ch}) \frac{-\pi'_H(s)}{\pi_C + \pi_H(s)}.$$

That is, the substitution effect will be larger the larger is the substitution elasticity between adult and children consumption in the parents' preferences, the closer is the intrahousehold allocation to an equal split between resources devoted to children and resources devoted to adults, and the more elastic it is the commodity price of human capital to the school subsidy.

In the empirical analysis that follows we attempt to estimate the substitution effect of school subsidies on resources devoted to children. A crucial problem in the analysis is that e_{ch} is not observable; we rely instead on observation of the share of expenditure devoted to children clothing. Children clothing is a particular type of infrequent purchase, so it is likely to lead to measuring e_{ch} with error, including zero observations that, obviously, do not correspond to no expenditure being devoted to children. Letting S_g and S_b be the observed expenditure share of girls' and boys' clothing for a given household, we assume the following relationship

$$S_k = \begin{cases} (S_k^* + \upsilon)/P & \text{if } D > 0 \\ 0 & \text{otherwise} \end{cases}$$

for $k = b, g$, where S_k^* is the expenditure share of clothing derived from the household preferences, P is the probability of purchase, D is a latent variable describing the decision to purchase and υ captures optimization errors and random discrepancies in the process linking the observable variable S_k with the latent variable S_k^* (see e.g. Blundell and Meghir 1987).

For the estimation, we assume a linear form for S_k^* in terms of the school subsidy (approximated as the proportion of conditional income) and a number of observable variables that intend to capture heterogeneity in preferences and in household production technology, as suggested by the model. If we take S_k^* to be a linear first-order approximation to the expenditure share of clothing as derived from the CES example, then the coefficient of the proportion of conditional income gives us the derivative of expenditure in clothing with respect to school subsidies. Under the assumption of constant returns to scale in the production of the basic commodities, expenditure in clothing is proportional to e_{ch} multiplied by the ratio of the price of clothing to $\pi_C + \pi_H(s)$. Thus, the coefficient of the proportion of conditional income is proportional to

$$\frac{e_{ch}(1 - qe_{ch})}{1 - q} \frac{-\pi'_H(s)}{\pi_C + \pi_H(s)},$$

and it captures the substitution effect.

Assuming that the random terms v and D are independent and that the expected values of S_k and S_k^* are equal, the equation for S_k^* can be estimated consistently applying OLS to the entire sample, including the zero observations, as described by Keen (1986) and Blundell and Meghir 1987).[4]

3 Empirical Analysis

3.1 Program description and data

The data we use comes from the evaluation of *Progresa*, the main anti-poverty program of the Mexican Government. This program provides cash grants to poor families in exchange for these families sending children to school regularly and fulfilling a schedule of family health clinic visits. The cash grants are given directly to the mother of the family. Grant amounts for the first semester of 1999 are detailed in Table 1. Maximum total monthly transfers per family were restricted in the first semester of 1999 to 695 pesos; a feature we take advantage of in the estimation.

Table 1. *Monthly Cash Benefits of Progresa*

Grants	Nutrition Grant		115	
	Education Grants:	Grade	Boys	Girls
	Primary School	3	75	75
		4	90	90
		5	115	115
		6	150	150
	Secondary School	1	220	220
		2	235	260
		3	245	285
Maximum Transfer per Household			695	
Avg Transfer to Eligible for Maximum			448	

In Mexican pesos (1999); 10 pesos was approximately US$1. 'Nutrition grants' are conditional on family health clinic visits and there is no explicit or implicit monitoring of spending in food.

[4] An alternative Tobit estimation leads to similar results.

At the start of the program, *Progresa* carried out a social experiment in which a random sample of 506 rural eligible communities were selected in seven Mexican states. 320 communities (the treatment group) were assigned to receive benefits in March 1998 and the remaining (the control group) were assigned to receive benefits about two years later. The baseline household census (ENCASEH97) was collected in November 1997. Follow-up after-program implementation interviews (ENCEL) were carried out in October 1998, May 1999, and October 1999. These surveys contain data on schooling, health, income and expenditures and household assets. We use the May 1999 round because it does not coincide with the beginning of the school year. Table 2 provides pre-program descriptive statistics.

Table 2. *Descriptive Statistics: Households with Children Aged 8 to 17*

	Households eligible for max benefits		All households	
Expenditures shares (percent)	Mean	Std. Dev.	Mean	Std. Dev.
Food	67.85	18.28	68.94	17.45
Boys' clothing	2.46	3.41	1.70	2.98
Girls' clothing	2.27	3.30	1.59	2.73
Men's clothing	1.61	2.64	1.69	3.12
Women's clothing	1.29	1.99	1.56	2.76
Transport	3.73	8.44	3.54	7.50
School attendance (percent)	Mean	Std. Dev.	Mean	Std. Dev.
Children 8 to 11	97	17	95	23
Children 12 to 17	46	50	51	50
Children 12 to 17 in secondary school	26	44	31	46
Other characteristics	Mean	Std. Dev.	Mean	Std. Dev.
Family size	8.5	2.0	6.6	2.2
Household head education (years)	2.3	2.1	2.7	2.5
Water and electricity (percent)	29.7	49.7	23.1	43.1
Dirt floor (percent)	67.4	46.9	72.7	44.5
Household head speaks indigenous language (percent)	33.6	47.2	39.1	50.1
Proportion of conditional transfers	52.1	18.3	11.5	23.2

Expenditures shares based on the control group in 1999, which we assume represents pre-program levels (no baseline data on expenditures was collected). All other variables based on pre-program 1997 data for the treatment group. Proportion of conditional transfers are calculated based on pre-program education attainment.

3.2 Empirical Specification

We estimate here how the household allocation varies with the proportion of *Progresa* benefits conditional to schooling. To compute a proxy for the school subsidy at the margin of decision of the family, we take the nutrition grants and the grants for children at the primary level to be "unconditional income," and then define the difference between unconditional income and the total maximum benefit, which is due to secondary school grants, as "conditional income." We use the proportion of conditional income of total potential benefits as a proxy for school subsidies. Previous studies have shown high impacts on secondary school enrollment but very low impacts of the program on primary enrollment, mainly because primary enrollment is as high as 96 % pre-program (Schultz 2004, Martinelli and Parker 2003b). While there are some limited effects of the program on reducing grade repetition in primary (Behrman, Sengupta and Todd 2005), the overall effects are small relative to the impacts on education at the secondary level, suggesting it is not unreasonable to treat primary grants as unconditional.

However, our measure of conditional income may overestimate conditional income for some families because some families would enroll their children in secondary school even without the program benefits. Such families are likely a minority; Table 2 shows that less than a third of children aged 12 to 17 are enrolled in secondary school prior to the program.[5] Note that both conditional and unconditional income refer to potential benefits and not to actually collected benefits. We calculate conditional income using the ages, gender, and schooling levels of children in 1997, just prior to program implementation. In this way, our definition of conditional income is exogenous to the program.

Variation in conditional income arises primarily from differences in children's schooling prior to the program, which affect the grants received if children enroll in school and thus the potential amount a household might receive from secondary school grants. Differences in children's education are not determined exclusively by age. There is substantial variation in schooling

[5] We carry out estimations omitting families with children enrolled in secondary school pre-program. However, families with children in secondary school probably spend more on their children, so omitting these families may create a selection problem. Results are similar to those obtained from the whole sample.

for children of the same age across families, due to late age of entry, grade failure and repetition as well as early dropout in the communities studied. For instance, 45 percent of 13 year old (pre-program) children had not yet completed primary school. Thus, controlling for age and gender composition, there is substantial variation in conditional income across families.[6]

We take advantage of the design feature of *Progresa* which limits total benefit amounts per family to focus on the sample of those eligible for the maximum benefits. We argue that the income and bargaining effects of the program are similar across families that could potentially receive the maximum level of benefits and thus restricting attention to a more homogeneous set of families we are better able to control for such effects.[7] We also provide results based on the sample of all families with children, include the maximum potential benefits for each family as a control variable. While this is a more heterogeneous sample, it is larger.

We estimate the following regression at the household level:

$$S_{hk} = \alpha_{0k} + \alpha_{1k} P_h + \alpha_{2k} D_h + \alpha_{3k} P_h D_h + \textstyle\sum_j \beta_{jk} X_{hj} + \upsilon_{hk},$$

where S_{hk} refers to indicator k (spending shares of adult male clothing, adult female clothing, boys' clothing and girls' clothing) for family h, P_h represents the proportion of conditional income for household h, calculated for both the treatment and control group, D_h is an indicator of whether the household is in the treatment group, X_{hj} represents the control variable j for household h, and υ_{hk} is a random component reflecting optimization errors, random discrepancies in the process linking purchases to consumption of clothing and preference heterogeneity. A suggested by the model, we include control variables such as household demographics, household expenditure, household assets and community level variables that are meant to capture heterogeneity in preferences and in household production technology. The treatment group

[6]For families eligible for maximum benefits, differences in pre-program education attainment of children explain almost 60 percent of the variation in the proportion of conditional income, with differences in the age and gender distribution of children explaining the remainder.

[7]Families eligible for the maximum benefits represent about 11 percent of all families. They tend to have a larger family size but look fairly similar in terms of other indicators of poverty (Table 2). Families at the maximum have a much larger proportion of conditional income relative to all families.

dummy captures program effects that have not been explicitly modelled; for instance, women are required to attend monthly health lectures, which may have had an impact on changes in diet and hence, expenditure patterns (Hoddinott and Skoufias 2005).

The estimator of α_{3k}, the coefficient of interest, is a double difference estimator, which tests whether the effect of potential conditional income is different for households in the treatment group than for those in the control group. Note that we could focus on the effect of conditional income only on households from the treatment group (in fact this gives very similar results). However, conditional income, in addition to capturing the subsidy effect of the program, could pick up other unobserved variables correlated with conditional income. For instance, households with a larger proportion of conditional income may be households with children of different abilities as evidenced by their previous overall achievement (and thus years of completed schooling) in school. The control group is useful for eliminating this potential bias because the behavior of the control group should not be affected by the program. If our constructed measure of conditional income also explains expenditure patterns for the control group, this would suggest that conditional income was picking up correlated unobserved variables.[8] Interacting conditional income with the treatment dummy differences out these potential unobserved variables. That is, assuming that conditional income provides a good measure of the subsidy rate and that the control group is not affected by the subsidy, the estimated coefficient α_{1k} gives an estimate of possible omitted variable bias.[9]

3.3 Results

Table 3 presents the effect of the proportion of conditional income on various categories of expenditures shares for families with children between the ages of 8 and 17.[10] Conditional income interacted with the treatment dummy

[8] This may happen because conditional income is not randomly assigned, but depends on fertility and schooling decisions prior to the program.

[9] Conditional income is constructed for the control group in the same way as for the treatment group, i.e. based on pre-program schooling of children.

[10] We do not broaden this category to children less than 8 as program grants begin to be received for children in third grade. It is possible that through anticipation effects the

should show differing effects on spending on goods which are plausibly substitutes and complements with investment in children's human capital. In addition to our main sample of households eligible to receive the maximum benefits, we provide results based on an alternative sample including all households and a control for the maximum level of grants each household could receive.[11]

Results based on both samples are similar and supportive of substitution effects. The estimated coefficient of conditional income interacted with the treatment dummy on the proportion of resources dedicated to spending on both boys' and girls' clothing is positive and significant. With respect to the magnitude of the impacts, using the sample of all households eligible for the maximum level of benefits, an increase in the share of conditional income of about 10% (corresponding to an increase of about 35 pesos of conditional income and a corresponding decrease in unconditional income) would increase the share of spending on girls' clothing by 0.2, or an increase of 9% from pre-program levels. The results on adult male and female clothing are all insignificant, which is unfortunate since it would have provided corroborating evidence that the increase in resources spent in children clothing results from a reduction in resources devoted to the adults.[12][13]

program might improve enrollment at earlier ages, although the evidence for this is limited (Schultz 2004). Including families with children aged 6 to 17 does not change the results.

[11] For the first specification only, we also report coefficient estimates of conditional income. This represents the "effect" of conditional income for the control group. In the absence of omitted variables correlated with conditional income, we expect this effect to be zero.

[12] Tobit estimations lead to similar results for boys' and girls' clothing, and to negative but insignificant results for adult clothing.

[13] Relatedly, and equaly puzzling, Attanasio and Lechene (2002) report no effects of the proportion of female income on adult clothing shares.

Table 3. *Impact of Conditional Income on Expenditure Shares*

Households eligible for maximum benefit						
	Food	Boys' clothing	Girls' clothing	Women's clothing	Men's clothing	Transport
conditional income	-0.054	0.018	0.021	0.007	0.001	0.000
× treatment group	(0.046)	(0.010)*	(0.009)**	(0.006)	(0.008)	(0.021)
conditional income	0.001	-0.004	-0.009	-0.009	-0.002	0.012
	(0.041)	(0.009)	(0.009)	(0.006)	(0.007)	(0.019)
R^2	0.11	0.07	0.11	0.05	0.05	0.08
All households, including control for maximum benefits						
	Food	Boys' clothing	Girls' clothing	Women's clothing	Men's clothing	Transport
conditional income	0.007	0.006	0.008	0.003	-0.000	-0.009
× treatment group	(0.016)	(0.003)**	(0.025)**	(0.002)	(0.003)	(0.007)
R^2	0.11	0.11	0.13	0.04	0.04	0.06

Observations for the two specifications: 1596 and 8610 respectively

Standard errors clustered at community level in parenthesis

*Significant at 10%; **Significant at 5%; ***Significant at 1%

Regressions include a dummy for treatment group, conditional income and controls for age, sex, and education of household head and spouse, a dummy indicating whether they speak an indigenous language, number of boys and girls by age groups (0-2, 3-5, 6-8, 9-11, 12-14, 15-18), dummies for water and electricity access and for dirt floor, land (has.), ownership of refrigerator, stove, television, blender total household expenditures and its square, distance to school, distance to urban center, average community wage and community poverty index.

Table 4. *Impact of Conditional Income on Clothing Expenditure Shares (Controlling for the Proportion of Children Potentially in Secondary School)*

Households eligible for maximum benefits (May 1999)				
	Boys	Girls	Women	Men
conditional income	0.050	0.030	-0.009	-0.012
× treatment group	(0.019)**	(0.020)	(0.013)	(0.016)
R^2	0.07	0.11	0.05	0.05
Households eligible for maximum benefits (October 1998)				
	Boys	Girls	Women	Men
conditional income	0.041	0.036	0.014	0.005
× treatment group	(0.017)**	(0.018)**	(0.011)	(0.013)
R^2	0.06	0.09	0.05	0.04
Households eligible for maximum benefits (October 1999)				
	Boys	Girls	Women	Men
conditional income	0.040	0.032	0.013	0.004
× treatment group	(0.018)**	(0.018)**	(0.013)	(0.011)
R^2	0.07	0.09	0.05	0.04
All households, controlling for maximum benefits (May 1999)				
	Boys	Girls	Women	Men
conditional income	0.018	0.021	0.004	-0.005
× treatment group	(0.005)***	(0.004)***	(0.004)	(0.005)
R^2	0.11	0.13	0.04	0.04

Observations: 1596, 1680, 1649 and 8610. Same controls as in Table 3, as well as the proportion of children in secondary school age and an interaction for the proportion of children in secondary school age with treatment.

Since the proportion of conditional income is correlated with the proportion of children in secondary school, it is conceivable that we overestimate substitution effects if, somehow, income and bargaining effects of the program are larger for secondary school than for primary school children and thus correlated with our conditional income measure. We thus re-run the regressions reported in Table 3, including additional variables measuring the proportion of children potentially (e.g. according to pre-program schooling levels) enrolled in secondary school and its interaction with the treatment group dummy. Results are reported in Table 4.

In spite of high collinearity between conditional income and the proportion of children potentially in secondary school (0.85),[14] in Table 4 we gener-

[14]Remaining variation in conditional income derives from gender and grade differences in grants.

ally continue to estimate significant effects of conditional income interacted with the treatment dummy for spending on girl's and boy's clothing. As a robustness check, we have estimated the effect of the proportion of conditional income on clothing shares for the other two available waves of after-program interviews, corresponding to October 1998 and October 1999, with similar results.

A final point of interest is the potential size of the substitution or conditionality effect relative to the total program effect. To answer this question, we have estimated the total program effect on household expenditures using the sample of households eligible for the maximum amount of benefits (Martinelli and Parker 2003b). The total effect of the program on the household expenditure share of boys' and girls' clothing is about 0.9 percentage points. Our estimates in Table 4 suggest that an increase of 10 percentage points in the proportion of conditional income would increase spending on girls' clothing by about 0.2. Conditionality seems responsible for a large percentage of the total program effect.

4 Conclusions

In this paper, we propose a model to analyze the impact of school subsidies for the poor on intra-household allocations. If schooling is an input in the production of human capital, then school subsidies will reduce the shadow price of human capital accumulation and henceforth lead to a reallocation of household resources toward this activity. Thus, the model suggests that in order to assess the impact of school subsidies on human capital accumulation it may be useful to consider not only the direct impact on schooling but also the impact on household expenditure patterns. However, since school subsidies for the poor typically involve monetary transfers to the mother of the family, the impact of the subsidies on household expenditures may be due to the increased bargaining power of the mother rather than to the impact of the school subsidies on the shadow price of human capital. This means that it is important to isolate bargaining from substitution (that is, conditionality) effects of school subsidies. A simple CES example shows that, surprisingly enough, positive bargaining effects coupled with the assumption of efficient bargaining in the family imply strong substitution effects.

We use data from the evaluation of *Progresa*, a program of school subsidies for the poor in Mexico, and estimate the substitution effects of the program. Ideally, distinguishing between conditionality and bargaining effects could be done by comparing the impact of the program on two groups of similar households, one receiving conditional transfers and one receiving unconditional transfers. Since that was not the social experiment conducted, we approximate it by exploiting the fact that the program establishes a cap to total monthly benefits per household that is binding for a sample of about 1600 families. We also exploit the fact that pre-program enrollment in primary school was already very high, so the relevant margin of decision for beneficiary families is whether to send (more of) their children to secondary school. Thus, we treat primary school grants as unconditional income, and we define conditional income as the remainder of the maximum benefit. Our estimates suggest a strong effect of the proportion of unconditional income to the maximum possible benefits over household expenditure patterns. We interpret this as evidence that the school subsidies have had an impact on the shadow price of human capital, and that household resources beyond those directly subject to conditionality have been reallocated favorably to children's human capital.

Some of the important effects of school subsidies involve intertemporal incentives for household allocation. A proper consideration these incentives requires a dynamic framework beyond what we have attempted in this paper, and it seems an exciting avenue of theoretical and empirical research. While we do not attempt to define an optimal level of school subsidy in this paper, our results suggests that any such attempt should take into account the effects of school subsidies on household allocations beyond the direct impact on school enrollment.

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